Showing the point at which gold was first discovered at the Calhoun Mine in Lumpkin County; photograph taken by S. W. McCallie, August 1913.

Gold Deposits of Georgia*

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GEOLOGIC SETTING

The gold deposits of Georgia are part of a more or less mineralized region that extends from Great Falls on the Potomac River to the Coastal Plain of Alabama. The mineral deposits of this region have many features in common and are generally associated with silicified sheeted zones or sheared zones that may represent faults of considerable throw. Approximately 500 properties in Georgia are known to be gold-bearing, and the general distribution of the deposits is shown in Figure 1.

The country rocks include a wide variety of schists and gneisses; in the Lumpkin County gold belt two formations are recognized--the Carolina gneiss and the Roan gneiss. The Carolina gneiss consists of crystalline schists and gneisses that are commonly micaceous. It includes mica schist, garnetiferous mica schist, quartzite, conglomerate, kyanite schist, and, locally, small bands and lenses of marble and graphitic schist[1]. The Roan gneiss was defined by Keith[2] as hornblende schists, hornblende gneisses, and schistose diorites that are found as sheet-like or intrusive masses in the Carolina gneiss. Crickmay agrees that many of the hornblendic masses are intrusive[3], but in several mines small hornblende nodules and thin sheets not of intrusive origin are found in the Carolina gneiss. This hornblende is thought to result from a rearrangement of the mineral components in the Carolina gneiss.

In the eastern part of the State the gold deposits are in the "slate belt", which extends into North and South Carolina. The rocks of this belt are mostly schistose volcanic tuff[4,5]. A little gold is found in other metamorphic rocks, mainly schists[6,7], in addition to that in the three rock series mentioned.

The gold-bearing rocks are intruded by numerous dikes and masses, which have granitic or pegmatitic textures. The intrusive rocks are of widely different compositions and exhibit all

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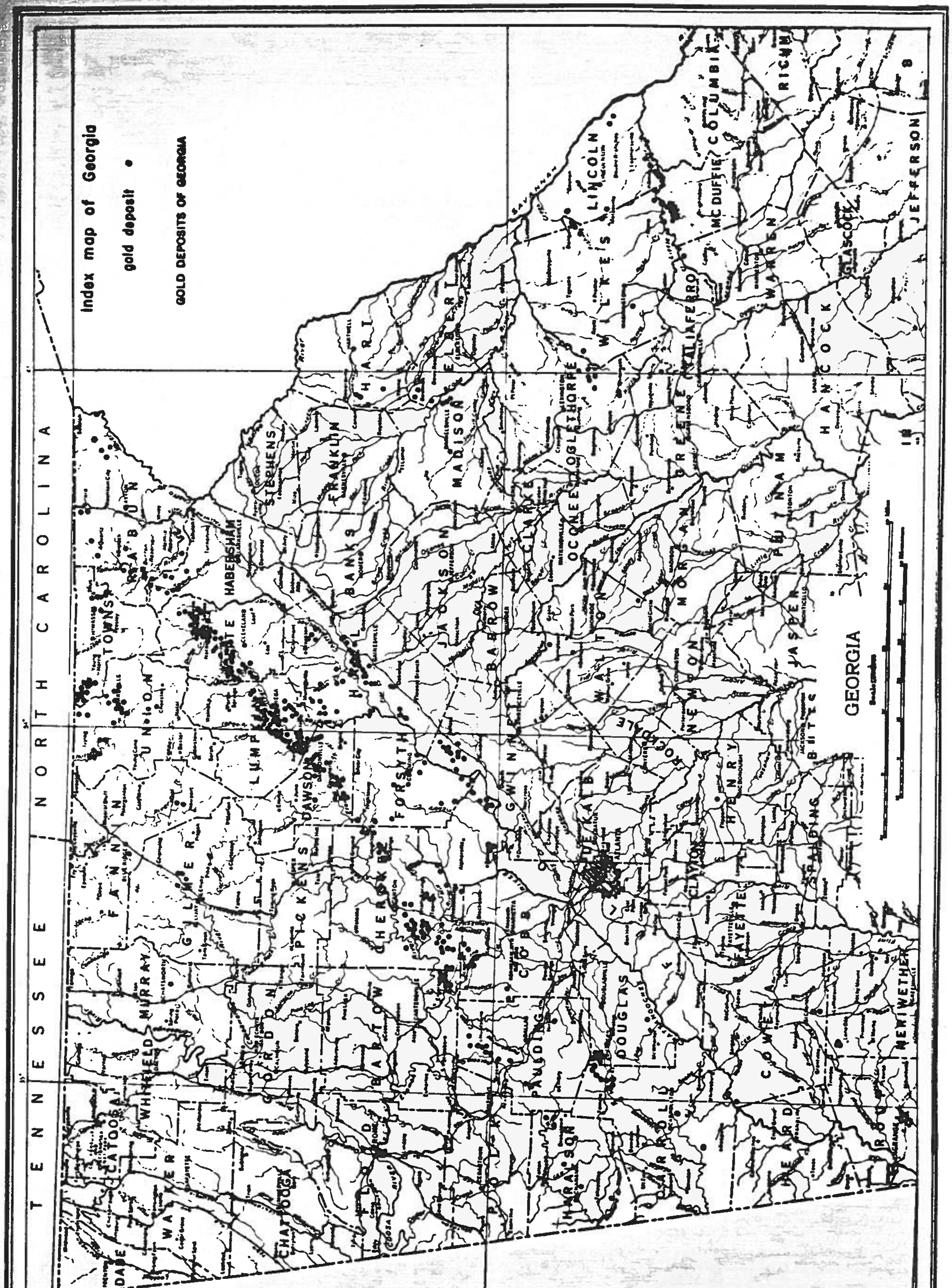
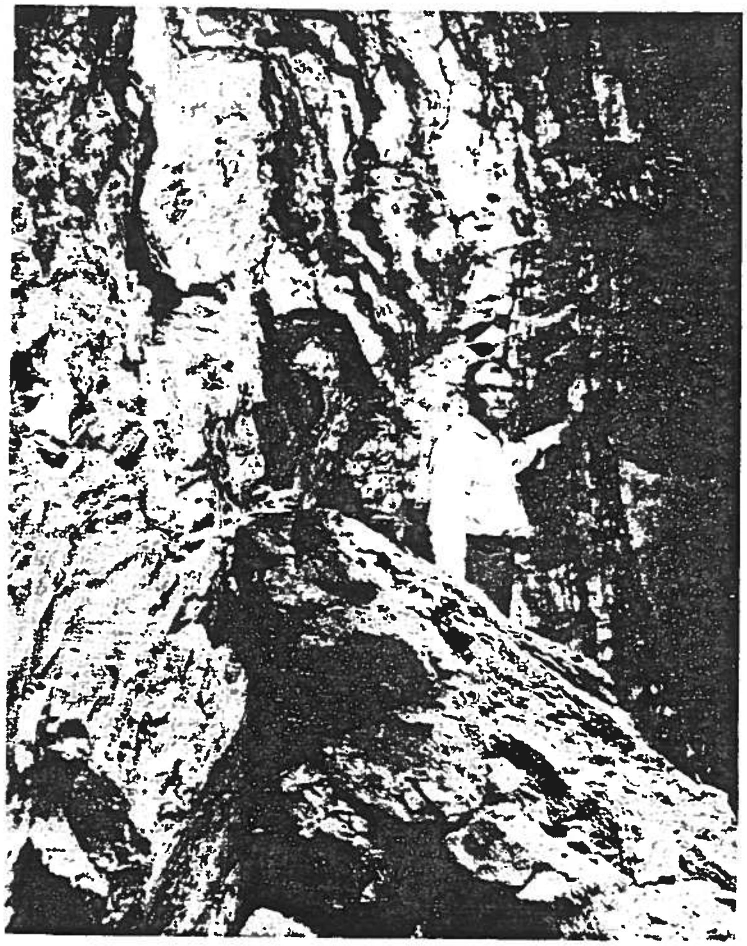

Index map of Georgia
gold deposit ●
GOLD DEPOSITS OF GEORGIA
TENNESSEE
NORTH CAROLINA
GEORGIA
DADE
WALKER
CATOOSA
WHITFIELD
MURRAY
FANNIN
GILMER
UNION
TOWNS
RABUN
HABERSHAM
WHITE
LUMPKIN
DAWSON
PICKENS
GORDON
CHATTOOGA
FLOYD
BARTOW
CHEROKEE
FORSYTH
HALL
BANKS
STEPHENS
FRANKLIN
HART
ELBERT
MADISON
JACKSON
BARROW
GWINNETT
COBB
PAULDING
POLK
HARALSON
CARROLL
DOUGLAS
DEKALB
ATLANTA
CLAYTON
FAYETTE
COWETA
HEARD
TROUP
MERIWETHER
SPALDING
HENRY
ROCKDALE
NEWTON
WALTON
CLARKE
OCONEE
OGLETHORPE
WILKES
LINCOLN
COLUMBIA
McDUFFIE
TALIAFERRO
GREENE
MORGAN
PUTNAM
JASPER
BUTTS
HANCOCK
WARREN
GLASCOCK
JEFFERSON
RICHMOND
SAVANNAH

degrees of metamorphism and hydrothermal alteration. Diabasic dikes of post-ore age are fairly common.


Free Jim Gold Mine, quarter mile east of the Square at Dahlonega, illustrating the occurrence of gold-bearing quartz vein in schist.

STRUCTURAL FEATURES

The detailed structure of the metamorphic rocks has been studied but little thus is imperfectly known. Foliation planes range widely in attitude, but trend in general about N. 45 E., and dip steeply either northwest or southeast. The recognizable remnants of bedding may diverge widely from the strike and dip of the schistosity although in places the two features nearly coincide. Folding has been mapped locally, and widespread faulting is recognized in two well-defined systems, one trending northeast, about parallel to the trend of regional schistosity and the other transverse to this feature. The northeastward striking breaks are zones, in places up to several hundred feet wide; they are characterized mainly by more intense shearing and better developed schistosity than the enclosing country rock and are mineralized in many places. The transverse or northwestward trending faults are generally well defined fractures that may or may not contain quartz veins, a few of which are gold bearing. Some of the fractures are filled with diabasic dikes.

Quartz greatly predominates in the gangue and some large bodies are found; generally, however, the quartz is in small (-4' thick) stringers and lenses. A few well-defined veins such as that at the Columbia mine in eastern Georgia (McDuffie County) are known, and elsewhere, as at the 301 Mine (Cherokee County) the ore is in a silicified zone, the boundaries of which are not sharp.

East wall of the Findley Cut made by hydraulic mining of saprolite ore (decomposed schist and quartz stringers).

MINERALIZATION

Hypogene: A few gold deposits in Georgia have been worked well below ground-water level where the conditions apparently preclude supergene enrichment of the gold. At the Creighton (Franklin) mine an ore shoot was mined continuously on a 53° incline for more than 900 feet[8]. The gangue of the deposits consists mainly of quartz and ankerite, but other somewhat unusual minerals are found. These include garnet, kyanite, tourmaline, staurolite, chlorapatite, gahnite, muscovite and biotite, chlorite, ilmenite, epidote, and magmetite. All of these minerals are seldom present in any one deposit and in some prospects they are scarce or absent.

The most common ore mineral is pyrite, which is generally scattered irregularly along cracks through the quartz and may or may not be gold bearing. At the Creighton mine and a few other properties pyrite forms massive, almost solid bodies. At the Battle Branch mine in Lumpkin County exceptionally high-grade pockets or lenses of gold with galena and other sulphides and coarse-grained silicates were found about 245 feet vertically below the surface. The bottom of this deposit has not been reached[9].

is photograph of the Calhoun vein illustrates features mmon to the rich veins of the district.

t the Field, Lockhart, Benning, Jumbo, Etowah, nd probably many other prospects, the deposits ontain pyrrhotite, most of which is not gold- earing. A little arsenopyrite was seen in ore rom the Etowah and Kin Mori mines, and chalco- yrite is found in small grains in nearly all re.

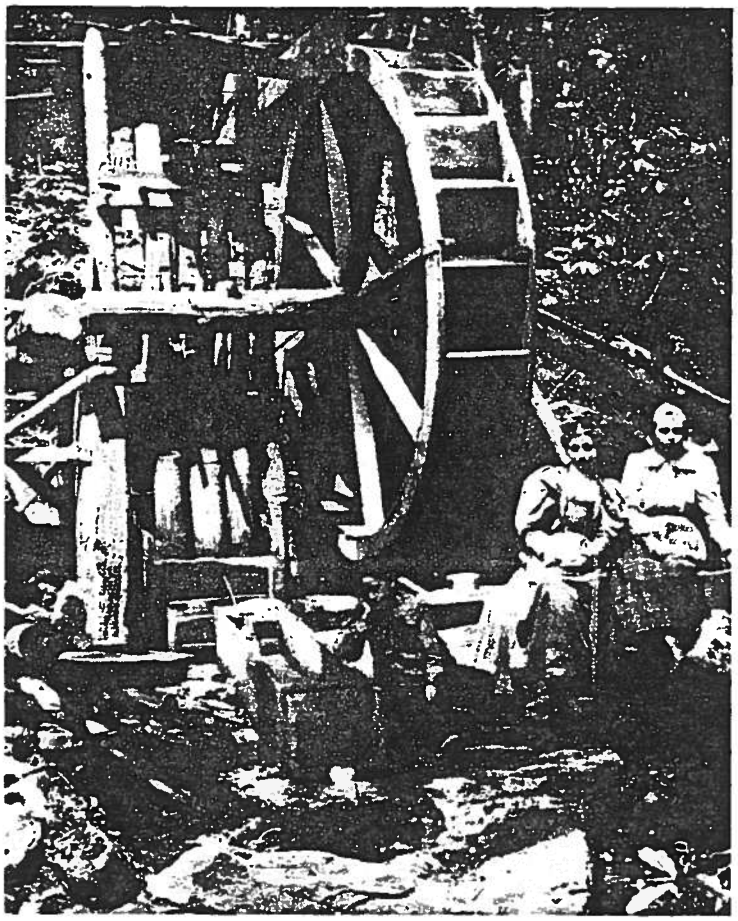
Supergene: The opinion is widely ex- ressed among mining men that the gold deposits f the Southern Appalachians are "pockety" and f low grade except where enriched near the sur- ace. It is true that in many places the near urface ores were richer than those in depth hrough profitable shoots of deep ore have been ined. The study of the problem of supergene old is difficult in Georgia because of the mall extent of accessible underground work- ngs. The problem is further complicated by he decomposed condition of much of the country ock. Such weathered rock, in which the origi- al texture is largely preserved, is known as aprolite and is commonly from 35 to 150 feet n depth. It is very porous and allows free irculation of descending waters; some speci- ens show more than 50 percent pore space. The pper part or soil zone of the saprolite is dis- urbed by plant roots and organisms and by soil reep; the original texture is destroyed. In he permeable soil and saprolite that overlie the old deposits the upper few inches, or even a ew feet, are leaner than the ground below. his is interpreted as due mainly to mechanical ettling of the heavy gold particles. Definite vidence of the amount of mechanical enrichment s lacking, although in places it is probably f economic importance.

Although some gold in the Georgia deposits has probably been dissolved, transported, and reprecipitated, the amount thus transferred seems to depend upon local conditions. Near the surface the nuggets that are recovered appear to be, on the average, larger than the particles found in depth. These nuggets possibly have been enlarged by the addition of gold from solutions. From a gold deposit in Alabama (Hog Mountain) gold is reported concentrated near the water level[10] and in North Carolina (Gold Hill) a specimen of basalt, probably of Triassic (post-ore) age, was seen coated with gold[1].

Panning for gold on Dukes Creek, White County.

FEATURES OF LOCAL CONTROL IN MINES

In all the mines and prospects examined quartz accompanies the gold, and where the richer bodies of gold ore are found, quartz is more abundant than elsewhere. At the Findley mine (Lumpkin County) the quartz bodies are elongated rods and pipes, with their long dimensions parallel to grooves that lie in the planes of schistosity. In many ways these quartz bodies resemble saddle reefs, with their external form controlled by grooves and furrows rather than by openings at the crests of folds in bedding. The rods and pipes range in length up to about 200 feet, and in horizontal section have a width from 2 inches to a known maximum of about 6 feet. In vertical section they have a depth in places comparable to the width; elsewhere they pinch out downward (and upward), generally within a few feet. They appear to be localized where quartz stringers cut the grooves and some are connected to other nearby quartz bodies by irregular quartz stringers. The grooves are particularly conspicuous in the Carolina gneiss (mica schist) and at many mines the ore bodies are in this gneiss next to the contact with metamorphosed diorite (?) (Roan gneiss). On Findley Ridge the contact between the Carolina gneiss and Roan gneiss swings from nearly east-west to about N. 30° E. and at the point of the bend the dip changes from north to southeast. As the ore bodies are near this contact it follows that the zone of pipes and rods dips either to the north or east, depending upon the location, but individual rods pitch persistently northeast. Away from the contact the quartz bodies gradually pinch out and become less numerous; at 100 to 200 feet from the contact they were too scarce to be profitably "hydraulicked."



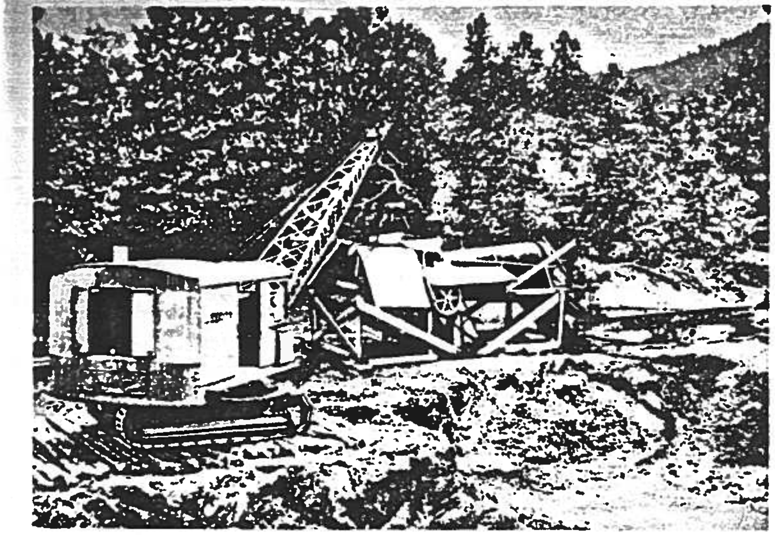
This early stamp mill was operated on the Thompson Lot, Nacoochee Valley, White County, around 1895. Wooden stamps with iron shoes were operated with pegs for cams by a water wheel.

The localization of the gold in quartz pipes, rods, and stringers in the Carolina gneiss along a contact with the Roan gneiss is a common feature in Georgia. The deposits on Findley ridge from the Lockhart mine to the Capps mine are along such a contact. At the Creighton mine, the Franklin pit is on a contact between Roan and Carolina gneiss, and the workings at the White County or Thompson property are also mostly in the Carolina at the Roan-Carolina contact. This relationship probably exists at other prospects where it has not yet been recognized.

"Burning off" the mercury.

At the Barlow, Whim Hill, Ivy, McDonald, Singleton, Consolidated and other properties gold is in quartz stringers, which are irregularly distributed through sheared granitic dikes. The dikes range in thickness from about an inch to about 50 feet. The quartz stringers are generally confined to the sheared dikes, but locally project for a few feet into the adjacent rock. Throughout North Georgia bodies of intrusive granite and gneiss are common, but only a small proportion of the bodies is mineralized.

At other mines such as the Battle Branch, Betz, the properties seen in the McDuffie County belt, Kin Mori, and many prospects in White and Dawson Counties, the ore bodies are in a crystalline micaceous schist, and do not appear to be along contacts. The ore bodies in these places are localized on sheeted or sheared zones, particularly where these zones are silicified and cut by later fractures. This feature was well shown at the Battle Branch mine, where the ore was richer in the more fractured parts of the lode, at or near the crests of small rolls. The shoots were pod-shaped or cylindrical with the pods pinching and swelling down the dip. Notable irregularities in the outlines of the shoots are caused by pre-ore seams. In places the ore bodies terminate abruptly against the seams;



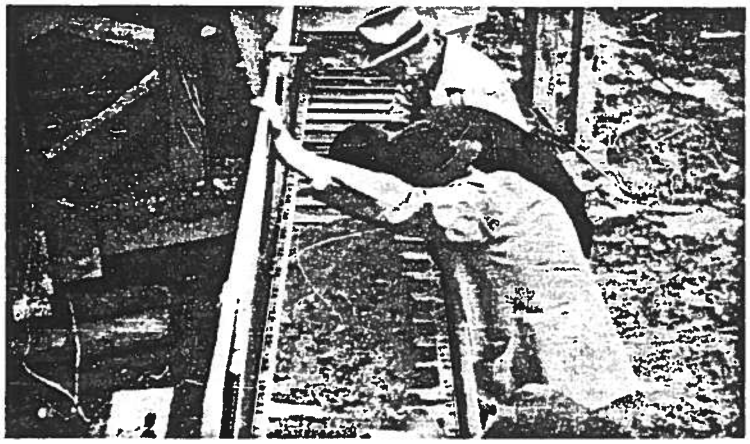
Dragline excavator; hopper on left feeds ore into revolving trammel screen on right; sand is washed clean and passes through openings in the screen to riffle box; gravel discarded on off-side by conveyor belt.

elsewhere, the mineralizing solutions were deflected by the seams into new channels. Generally the ore shoots are less than 6 feet wide and 2 feet thick, although exceptional bodies are larger. The lengths reach a known maximum of about 100 feet, although in the longer bodies the ore forms a series of pockets connected by gold-bearing streaks. The ore in the shoots consists predominantly of quartz, galena, ankerite, and gold. Red almandite garnet is generally found near the borders of the ore and some shoots were bounded by thin tube-like shells of garnet. Small bunches of kyanite were found near the bottoms of two of the shoots. An interesting and significant feature of the deposit is that almandite garnet, biotite, muscovite, kyanite, tourmaline, and staurolite are found both in the lode and the surrounding country rock. Near the ore bodies these minerals become coarser grained; the garnet ranges from 1/8 inch diameter in the country rock to 1½ inches diameter in the lode, and kyanite, which is in microscopic crystals in the country rock, was found in crystals up to 3 inches long in one shoot. The minerals that are constituent of both the lodes and the country rocks are coarser in the lodes. This characteristic appears to be a common though not a universal feature of the gold deposit from Lumpkin County, southwest as far as the Franklin mine in Alabama, but to the northeastward and in eastern Georgia is not conspicuous.

GENERAL FEATURES

The three types of ore shoots discussed, namely, those localized in the Carolina gneiss along contacts with the Roan gneiss, those concentrated in shear granitic dikes, and those found in silicified sheeted zones, have many features in common. They are all in hard, brittle rocks, and the surrounding material is generally soft and readily flows under pressure without fracturing. The localization of the shoots appears to be dependent upon the physical properties of the rocks rather than upon their chemical nature.

The texture and structures of the quartz in the gold ore shoots are of considerable interest. The gold-bearing quartz at and near the surface is usually iron-stained and sugary, and platy or laminated structures accentuated by thin layers of sericite are common. Some lodes, such as the Sulphurette vein at the Kin Mori mine, although sugary at the surface, are bluish gray massive quartz below the thoroughly oxidized material. A few veins, such as those of the McDuffie County belt, are platy, but the sugary texture is not well-developed. Barren quartz is generally white, massive and vitreous.



Sluice box with Hungarian riffles which collect the gold from the washed sands.

DEPTH OF ORIGINAL COVER

The depth of the original mineral deposition is difficult to estimate. Becker[11] remarked that the southern veins had been subjected to long continued erosion and that the present croppings are far below the original ones, possibly as much as 15,000 or 20,000 feet. Lindgren[12] seems to concur in this belief without definite commitment as to depth of cover. The prevailing mineral associations and coarse textures indicate deposition under conditions that ordinarily are thought to prevail in the hypothermal or deep vein zone.

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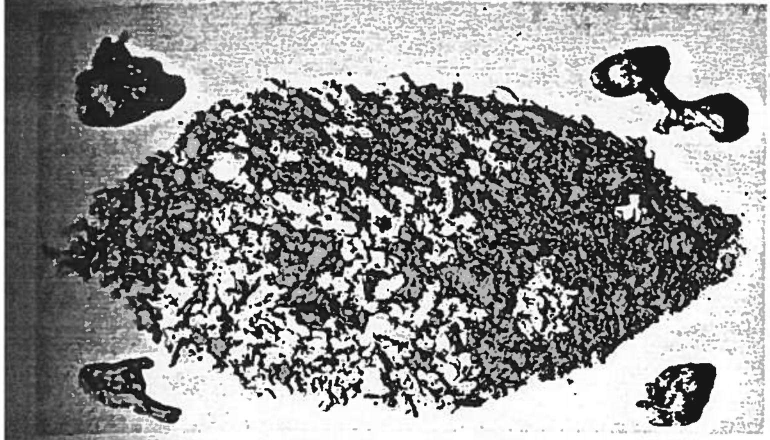

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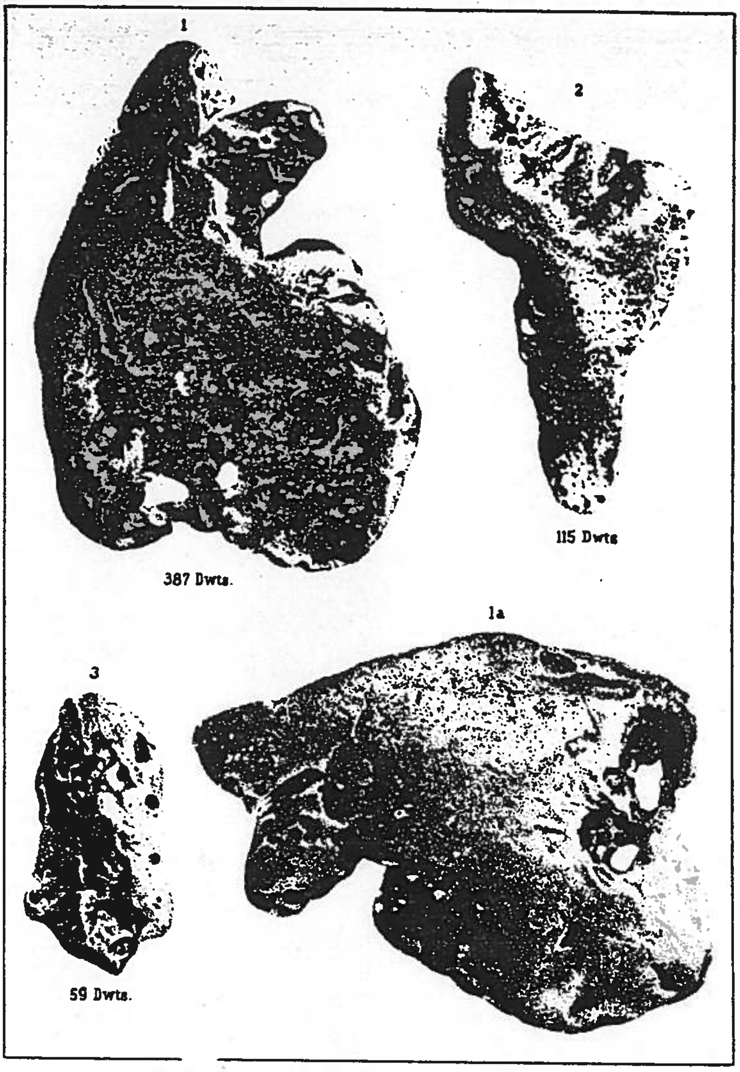

Gold Nuggets from the Nacoochee Gold Placers Georgia.

(Mines of the Nacoochee Hydraulic Mining Company.)

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Hydraulic mining for placer gold in Lumpkin County.